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Stem Cell-Based Aesthetics: Integrating Regenerative Science with Patient-Centered Ethics

Estética basada en células madre: integración de la ciencia regenerativa con la ética centrada en el paciente

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Resumen

La medicina regenerativa está transformando la cirugía estética al pasar de la corrección temporal a la restauración biológica real. Este estudio multicéntrico, realizado en México, Colombia y Ecuador con 180 participantes, evaluó la eficacia clínica, el desempeño histológico, la seguridad y la percepción ética de tres intervenciones estéticas: injerto de grasa enriquecido con células madre derivadas del tejido adiposo (ADSC), terapia con plasma rico en plaquetas (PRP) y relleno con ácido hialurónico. Se realizaron evaluaciones estandarizadas a 1, 3 y 6 meses, midiendo satisfacción, retención volumétrica, elasticidad dérmica, eventos adversos, regeneración histológica y comprensión ética mediante instrumentos validados. Los resultados mostraron que el injerto de grasa enriquecido con ADSC alcanzó los mejores resultados globales, con una satisfacción media de 8.6 ± 0.9, retención volumétrica del 72.3% y mayor elasticidad cutánea (0.89 mm), manteniendo además la menor tasa de complicaciones (28.3%). La terapia PRP mostró una mejoría dérmica moderada y alta seguridad (38.3% de eventos leves), mientras que los rellenos de ácido hialurónico presentaron menor duración (28.7% de retención) y mayor respuesta inflamatoria (51.7%). El análisis histológico confirmó una angiogénesis superior, colágeno bien organizado y mínima fibrosis en los tejidos tratados con ADSC. Se observó una correlación positiva significativa entre percepción ética y satisfacción del paciente ($r = 0.71$, $p < 0.001$), resaltando la importancia de la comunicación y la transparencia. Las terapias regenerativas autólogas emergen así como alternativas superiores que integran eficacia, biocompatibilidad y confianza ética. La convergencia entre biología regenerativa y responsabilidad bioética define el nuevo paradigma de la cirugía estética de próxima generación, que une innovación e integridad para alcanzar una belleza sostenible y centrada en el paciente.

Palabras clave: Medicina regenerativa; células madre derivadas del tejido adiposo; plasma rico en plaquetas; cirugía estética; bioética; regeneración tisular.

Abstract

Regenerative medicine is transforming aesthetic surgery by shifting its purpose from temporary cosmetic correction to true biological restoration. This multicenter study, conducted in Mexico, Colombia, and Ecuador with 180 participants, evaluated the clinical efficacy, histological performance, safety, and ethical perception of three aesthetic interventions: adipose-derived stem cell (ADSC)-enriched fat grafting, platelet-rich plasma (PRP) therapy, and hyaluronic acid filler. Standardized assessments were carried out at 1, 3, and 6 months, measuring satisfaction, volumetric retention, dermal elasticity, adverse events, histological regeneration, and ethical comprehension using validated instruments. The results demonstrated that ADSC-enriched fat grafting achieved the highest overall outcomes, with a mean satisfaction score of 8.6 ± 0.9, volumetric retention of 72.3%, and superior skin elasticity (0.89 mm), while maintaining the lowest complication rate (28.3%). PRP therapy provided moderate dermal improvement and high safety (38.3% minor events), whereas hyaluronic acid fillers showed reduced durability (28.7% retention) and greater inflammatory response (51.7%). Histological analysis confirmed enhanced angiogenesis, organized collagen alignment, and minimal fibrosis in ADSC-treated tissues. A strong positive correlation was observed between ethical perception and patient satisfaction ($r = 0.71$, $p < 0.001$), underscoring the importance of communication and transparency in aesthetic outcomes. Autologous regenerative therapies therefore emerge as superior alternatives, integrating efficacy, biocompatibility, and ethical confidence. The convergence of regenerative biology and bioethical responsibility defines the new paradigm of next-generation aesthetic surgery, merging innovation with integrity to achieve sustainable and patient-centered beauty.

Keywords: Regenerative medicine; adipose-derived stem cells; platelet-rich plasma; aesthetic surgery; bioethics; tissue regeneration.

1. Introducción

Over the last two decades, aesthetic surgery has transitioned from being primarily reconstructive and appearance-oriented to embracing the principles of regenerative medicine. This paradigm shift has redefined traditional surgical objectives, evolving from the mere correction of defects toward the biological restoration of tissues through the activation of intrinsic healing mechanisms. Advances in stem cell biology, biomaterials, and growth factor technology have paved the way for innovative regenerative procedures that aim not only to rejuvenate but also to repair and sustain tissue vitality (Glass & Ferretti, 2019; Firriolo, Condé-Green, & Pu, 2022). This convergence between plastic surgery and regenerative science has created what is now termed next-generation aesthetic surgery, characterized by the integration of adipose-derived stem cells (ADSCs), platelet-rich plasma (PRP), exosomes, and bioengineered scaffolds into facial and body procedures (Alves & Samadi, 2019; Li et al., 2024; Olivas & Ramírez, 2025).

The increasing adoption of these techniques underscores a global trend toward biologically based interventions that offer long-term results and improve tissue homeostasis. Numerous studies have reported the clinical advantages of ADSCs and PRP, highlighting their potential to enhance angiogenesis, stimulate collagen synthesis, and improve overall tissue quality (Gentile, Garcovich, & Scioli, 2015; Arena et al., 2025). However, the growing popularity of these regenerative treatments has also raised questions about the standardization of methodologies, reproducibility of outcomes, and ethical oversight, especially as they expand beyond research centers into private clinical practice (Jayaram, 2025; Ganesan & Kim, 2025).

Adipose tissue, once considered merely an inert filler, is now recognized as one of the richest sources of mesenchymal stem cells in the human body. These adipose-derived stem cells are capable of differentiating into multiple lineages, including adipogenic, osteogenic, and chondrogenic, and secrete a variety of growth factors that modulate tissue repair (Arshad et al., 2018; Sterodimas et al., 2010). When combined with the stromal vascular fraction (SVF), fat grafting procedures have shown higher graft survival, improved neovascularization, and better integration within host tissues (Firriolo et al., 2022; Krastev et al., 2018; Schiraldi, Hashimoto, & Yoshimura, 2022). Similarly, PRP—an autologous concentration of platelets and plasma proteins—has emerged as a cornerstone in regenerative therapies, acting as a reservoir of bioactive molecules such as vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and transforming growth factor-beta (TGF-β), which promote dermal remodeling and fibroblast proliferation (Alves & Grimalt, 2018; Nanda & Grover, 2021; Pixley et al., 2023).

Clinical evidence supports these approaches across multiple domains. Trials such as NCT01372566 and NCT03965936 (ClinicalTrials.gov, 2011, 2019) demonstrated improved dermal thickness and elasticity after PRP and ADSC-based interventions. Furthermore, systematic reviews have reported that autologous fat grafts enriched with SVF yield superior volumetric retention compared to traditional lipoaspirates (Firriolo et al., 2022; Arena et al., 2025). Likewise, the introduction of exosome-based and bioengineered scaffolds has expanded the possibilities of noninvasive regeneration, further blurring the boundaries between aesthetic improvement and therapeutic restoration (Sindhi et al., 2025).

Despite these promising developments, significant scientific and ethical challenges persist. The absence of standardized protocols for cell isolation, PRP preparation, and scaffold integration leads to high variability in outcomes and hinders reproducibility across clinical settings (Krastev et al., 2018; Schiraldi et al., 2022). Moreover, in many regions, the commercialization of unverified stem cell therapies and bioactive products has outpaced regulatory frameworks, exposing patients to potential risks under the guise of innovation (Jayaram, 2025). This situation is particularly notable in Latin America—especially in Mexico, Colombia, and Ecuador—where the

rapid expansion of regenerative procedures in the private sector has created an urgent need for ethical oversight, cross-institutional collaboration, and evidence-based training programs (Nowacki et al., 2017).

From an ethical standpoint, the growing demand for regenerative aesthetic procedures raises questions regarding informed consent, data transparency, and patient vulnerability in elective contexts. Patients may overestimate the scientific validity of these interventions due to persuasive marketing or the misuse of scientific terminology, such as “stem cell facelift” or “cellular rejuvenation,” often without rigorous clinical evidence supporting those claims (Jayaram, 2025; Li et al., 2024). This “therapeutic misconception” underscores the importance of professional responsibility and bioethical literacy among practitioners. Establishing clear communication and standardized consent processes becomes essential to ensuring that aesthetic innovation aligns with principles of autonomy, beneficence, and non-maleficence.

The need for a harmonized international framework becomes evident when considering the heterogeneity of current practices. Some nations have established preliminary regulatory mechanisms to oversee cellular and regenerative therapies, while others lack specific guidelines altogether (Ganesan & Kim, 2025). This disparity allows the proliferation of unregulated procedures and complicates multicenter collaboration and data comparison. As aesthetic medicine continues to globalize, the convergence of scientific rigor and ethical governance will determine its sustainability and credibility in the coming decades (Nowacki et al., 2017; Arena et al., 2025).

Based on these gaps, the present study was designed to evaluate the efficacy, safety, and ethical implications of regenerative interventions in aesthetic surgery across three Latin American countries—Mexico, Colombia, and Ecuador. It seeks to establish a comprehensive framework linking biological mechanisms, clinical performance, and ethical responsibility. The central hypothesis proposes that regenerative procedures utilizing autologous biological materials, such as PRP and ADSC-enriched fat grafts, achieve superior patient satisfaction, vascularization, and tissue integration compared to conventional fillers, provided that their application adheres to ethical standards and professional training (Gentile et al., 2015; Firriolo et al., 2022; Li et al., 2024).

The design of this investigation aligns with that hypothesis, employing an interdisciplinary methodology that bridges clinical outcomes with bioethical analysis. By correlating regenerative biology with patient-reported satisfaction and professional accountability, this study aims to contribute to the formulation of standardized guidelines for safe, effective, and ethically responsible regenerative aesthetic surgery. Ultimately, it underscores that the progress of next-generation cosmetic procedures must depend not only on scientific breakthroughs but also on a shared ethical commitment to protect patients and preserve the integrity of medical science (Arena et al., 2025; Jayaram, 2025; Olivas & Ramírez, 2025).

2. Metodología

1. Study Design

This investigation adopted a **multicenter, prospective, and observational design**, developed in collaboration among institutions and private surgical centers in **Mexico, Colombia, and Ecuador** between January 2023 and March 2025. The study was structured to evaluate the **clinical efficacy, safety, and ethical implications** of regenerative interventions in aesthetic surgery, including *adipose-derived stem cell (ADSC)*–enriched fat grafting, *platelet-rich plasma (PRP)* therapy, and conventional hyaluronic acid fillers.

The methodological framework followed international research standards for biomedical ethics and adhered to the principles of the Declaration of Helsinki (2013 revision). Institutional review boards from each participating center approved the study protocol prior to data collection.

The research design aimed to correlate **biological mechanisms** of tissue regeneration with **patient-reported outcomes**and **ethical practice indicators**, adopting an interdisciplinary approach that integrated clinical, biological, and bioethical perspectives (Ganesan & Kim, 2025; Jayaram, 2025).

2. Participants

A total of **180 adult participants** (aged 25–65 years) were recruited across three countries: 60 from Mexico (Hospital de Especialidades Estéticas de Cuernavaca), 60 from Colombia (Clínica de Cirugía y Rejuvenecimiento de Bogotá), and 60 from Ecuador (Centro de Investigación en Medicina Regenerativa de Quito).

Inclusion criteria included healthy adults seeking elective aesthetic procedures for facial or neck rejuvenation, with no prior regenerative or filler treatments within the past 12 months. Participants provided written informed consent after being thoroughly informed about procedural risks, benefits, and expected outcomes.

Exclusion criteria encompassed patients with systemic autoimmune disorders, active infections, coagulopathies, pregnancy, or history of malignancy. Those unable to attend follow-up appointments or with prior surgical complications were also excluded.

Demographically, 79% of the participants identified as female and 21% as male, with an average age of **42.6 ± 9.8 years**. The socioeconomic distribution ranged from middle to upper-middle income, representative of patients typically accessing aesthetic medical services in Latin America.

3. Sampling Procedure

Participants were selected through **non-probabilistic purposive sampling**, targeting individuals meeting the inclusion criteria at the three clinical sites. Based on previous studies with similar outcome measures (Firriolo et al., 2022; Arena et al., 2025), the required sample size was estimated using a confidence level of **95%**, a statistical power of **80%**, and an expected mean difference of 15% in satisfaction scores between groups. This resulted in a minimum target of 50 participants per treatment group; however, to enhance robustness and account for potential attrition, the sample was increased to 60 per group.

The margin of error for comparative analyses was set at **±5%**, with standardized data collection protocols applied across all sites to ensure methodological consistency and minimize inter-operator variability (Krastev et al., 2018).

4. Techniques and Instruments

Data were collected using both **quantitative and qualitative tools** to assess clinical, histological, and ethical dimensions.

1. **Clinical outcomes** were evaluated through:
    - *Standardized digital photography* pre- and post-procedure at 1, 3, and 6 months.

- *Three-dimensional facial scanning* for volumetric retention analysis, calibrated in millimeters.
- *Dermal elasticity measurements* using a Cutometer® dual-probe system (Courage + Khazaka Electronic GmbH, Germany).

2. **Patient-reported outcomes** were measured using a validated satisfaction questionnaire adapted from the FACE-Q Aesthetic Module (ISAPS, 2018), scored on a 10-point Likert scale. The internal consistency reliability of the adapted tool was $\alpha = 0.91$.
3. **Histological evaluation** (performed on consenting participants undergoing minor revisions) employed hematoxylin-eosin and CD31 immunohistochemical staining to quantify angiogenesis and collagen remodeling (Li et al., 2024).
4. **Ethical assessment** involved structured interviews with participants and professionals, designed to evaluate comprehension of informed consent, perceived transparency, and satisfaction with risk disclosure (Jayaram, 2025; Nowacki et al., 2017).

To ensure data reliability, all evaluators were trained under the same protocol, and inter-rater reliability for photographic and volumetric analysis exceeded $\kappa = 0.85$.

5. Interventions

Participants were divided into three treatment arms:

1. **Group A – ADSC-Enriched Fat Grafting:** Autologous lipoaspirate was processed through enzymatic digestion and centrifugation to isolate stromal vascular fraction, then reinjected into the subdermal plane of target areas.
2. **Group B – PRP Therapy:** Autologous venous blood was centrifuged using a double-spin protocol (first spin 1200 rpm × 10 min; second spin 3500 rpm × 10 min) to yield a platelet concentrate, which was combined with microneedling or intradermal injection.
3. **Group C – Control (Hyaluronic Acid):** Cross-linked hyaluronic acid filler was injected following manufacturer guidelines to provide baseline comparison of aesthetic improvement and patient satisfaction.

All procedures were performed by board-certified aesthetic surgeons under aseptic conditions, and follow-up assessments occurred at baseline, 1, 3, and 6 months.

6. Variables and Operational Definitions

- **Primary outcome:** Patient satisfaction score (continuous variable; range 0–10).
- **Secondary outcomes:** Volumetric retention (%), dermal elasticity (mmHg), and rate of adverse events (%).
- **Ethical outcome indicators:** Level of comprehension of informed consent (Likert 1–5) and perceived transparency of procedure (qualitative coding). Operational definitions were established in alignment with prior research and international ethical standards in regenerative medicine (Alves & Samadi, 2019; Gentile et al., 2015; Sindhi et al., 2025).

7. Data Analysis

Data were processed using **IBM SPSS Statistics v.29.0**. Descriptive statistics were reported as means ± standard deviations for continuous variables and as percentages for categorical data. Intergroup comparisons were conducted using **one-way ANOVA** with post-hoc Tukey tests for

quantitative variables and **chi-square tests** for categorical outcomes. A p-value < 0.05 was considered statistically significant.

Qualitative interview data were analyzed through thematic content analysis to identify recurring ethical concerns, coded by two independent reviewers. Triangulation was employed to ensure the validity and depth of interpretive analysis (Ganesan & Kim, 2025).

8. Ethical Considerations

All participants provided informed consent, and their anonymity was strictly preserved. The study complied with ethical research principles established by the **World Medical Association** and adhered to country-specific regulatory frameworks. Each participating institution established an independent bioethics committee to supervise compliance and transparency.

This section establishes a methodological foundation that connects clinical data collection, biological evaluation, and ethical reflection within the emerging field of regenerative aesthetic surgery. The rigor of this design supports reproducibility, comparability, and ethical accountability—essential for advancing evidence-based practice and global safety standards (Jayaram, 2025; Nowacki et al., 2017; Arena et al., 2025).

3. Resultados

This section presents the principal findings obtained throughout the study, highlighting the quantitative and qualitative data that form the empirical foundation for the conclusions discussed in subsequent sections. The results are organized to provide a comprehensive overview of the clinical, biological, and ethical dimensions evaluated across the three treatment groups: adipose-derived stem cell (ADSC)–enriched fat grafting, platelet-rich plasma (PRP) therapy, and hyaluronic acid filler control.

Descriptive and inferential statistical analyses were performed to assess the differences among the three interventions in terms of patient satisfaction, volumetric retention, dermal elasticity, and frequency of adverse events. Complementary histological and ethical assessments were included to provide a multidimensional understanding of the outcomes. All values are presented as mean estimates and confidence intervals, allowing for a clear interpretation of central trends and variability among participants, without reporting individual data points.

The organization of this section follows a logical progression:

- Figure 1 summarizes the demographic and baseline characteristics of participants.
- Figure 2 depicts the distribution of patient satisfaction scores across treatment groups.
- Figure 3 illustrates the volumetric retention rates and dermal elasticity findings over time.
- Figure 4 presents the comparative incidence of adverse events observed throughout the follow-up period.
- Figure 5 provides an overview of the histological observations, focusing on neovascularization and collagen remodeling patterns.
- Figure 6 outlines the ethical and consent-related indicators reported by participants.

The subsequent figures collectively capture the main quantitative relationships and categorical patterns derived from the data analysis. Together, they offer an integrated perspective on the

performance and safety of regenerative aesthetic procedures performed in Mexico, Colombia, and Ecuador, while maintaining a consistent methodological and analytical approach across all centers.

Figure 1

Baseline Demographic and Clinical Characteristics of Participants

Variable	Group A (ADSC-Enriched Fat Grafting)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)	Total (N = 180)
Participants (n)	60	60	60	180
Age (years, mean ± SD)	42.3 ± 9.6	43.1 ± 9.2	42.4 ± 10.1	42.6 ± 9.8
Sex distribution (F/M)	48 / 12	46 / 14	48 / 12	142 / 38
BMI (kg/m², mean ± SD)	23.9 ± 2.8	24.1 ± 3.1	24.3 ± 2.7	24.1 ± 2.9
Ethnic composition (% mestizo)	83.3 %	81.7 %	85.0 %	83.3 %
Previous aesthetic procedures (%)	28.3 %	26.7 %	25.0 %	26.7 %
Tobacco use (%)	10.0 %	13.3 %	11.7 %	11.7 %
Alcohol consumption (occasional, %)	38.3 %	40.0 %	36.7 %	38.3 %
Comorbidities (controlled, %)	8.3 %	10.0 %	11.7 %	10.0 %
Average follow-up (months)	6	6	6	—

Figure 1 illustrates the demographic and baseline clinical characteristics of the 180 participants recruited for this multicenter investigation conducted in Mexico, Colombia, and Ecuador. Ensuring group comparability at baseline was essential for the validity of subsequent inferential analyses. Statistical testing confirmed no significant differences across age, sex, body mass index (BMI), ethnicity, or medical background among the three treatment arms ($p > 0.05$, ANOVA and chi-square tests).

The mean age of participants was approximately 42 years, with a range spanning from 25 to 65 years, which aligns with the typical demographic undergoing elective facial and neck rejuvenation in Latin America (Arena et al., 2025). The female predominance (78.9 %) corresponds to global epidemiological trends in aesthetic surgery, where women constitute nearly four out of five patients seeking regenerative or cosmetic enhancement procedures (Firriolo, Condé-Green, & Pu, 2022). Nonetheless, the inclusion of a 21 % male subgroup contributes to a more balanced understanding of satisfaction and tissue response across sexes, as recent literature highlights subtle physiological differences in skin thickness and collagen density between genders (Li et al., 2024).

The BMI distribution (mean 24.1 ± 2.9 kg/m^2) fell within the normal range for all groups, minimizing confounding metabolic influences on fat-derived stem cell viability and graft integration (Sterodimas et al., 2010). The participants' ethnic background—predominantly mestizo (≈ 83 %)—reflects the region's population structure and ensures that findings remain representative of the Latin-American aesthetic-surgery population. Variations in skin phototype and vascularization, which can influence dermal regeneration and postoperative pigmentation, were controlled by maintaining balanced group proportions (Gentile, Garcovich, & Scioli, 2015).

Lifestyle variables such as tobacco use (≈ 12 %) and occasional alcohol intake (≈ 38 %) were consistent across groups and remained within ranges considered non-interfering with wound healing or graft perfusion (Krastev et al., 2018). Likewise, controlled comorbidities (10 % overall), including mild hypertension and dyslipidemia, were evenly distributed and did not influence the eligibility of participants. The absence of major systemic disease and the balanced prevalence of prior aesthetic procedures (≈ 27 %) strengthen internal validity and facilitate the

attribution of observed effects to the interventions themselves rather than to patient heterogeneity.

The follow-up period averaged six months, sufficient to capture mid-term outcomes related to volumetric retention, dermal elasticity, and patient satisfaction. This duration aligns with prior regenerative surgery studies that evaluate fat graft maturation and PRP-mediated dermal remodeling within similar temporal frames (Alves & Grimalt, 2018; Nanda & Grover, 2021).

Overall, Figure 1 confirms the methodological integrity and baseline equivalence of the study population. Such homogeneity provides a solid foundation for the statistical comparisons and clinical interpretations that follow, ensuring that the forthcoming differences in satisfaction, histological findings, or complication rates are attributable to the biological nature of each regenerative technique rather than to demographic or lifestyle disparities. This baseline rigor aligns with the recommendations of international consensus statements on aesthetic-surgery research methodology (Olivas & Ramírez, 2025; Jayaram, 2025), reinforcing the scientific reliability of the present study.

Figure 2

Patient Satisfaction Scores by Treatment Group at 6-Month Follow-Up

Parameter	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)
Sample (n)	60	60	60
Mean satisfaction score (0–10)	8.6 ± 0.9	7.9 ± 1.2	7.2 ± 1.4
Median score (IQR)	9 (8–9)	8 (7–9)	7 (6–8)
Patients ≥ 8 points (%)	85 %	73 %	61 %
95 % CI for mean	8.3 – 8.9	7.5 – 8.3	6.8 – 7.6
Between-group p value (ANOVA)	—	—	p < 0.001

Figure 2 displays the distribution of global satisfaction scores reported by participants six months after the procedures. The overall tendency indicates higher satisfaction among patients treated with autologous regenerative interventions compared to those who received conventional hyaluronic-acid fillers.

Patients in Group A (ADSC-enriched fat grafting) achieved the highest mean score (8.6 ± 0.9), followed by Group B (PRP therapy) (7.9 ± 1.2) and the control group (7.2 ± 1.4). One-way ANOVA demonstrated statistically significant differences among the three groups ($p < 0.001$). Post-hoc Tukey analysis confirmed that the difference between the ADSC group and the control group was highly significant ($p = 0.002$), whereas PRP and control also differed modestly ($p = 0.04$).

The higher scores associated with ADSC-based procedures are consistent with prior clinical findings showing superior outcomes in long-term tissue integration and volumetric stability of fat grafts enriched with stromal-vascular fraction (Firriolo, Condé-Green, & Pu, 2022; Krastev et al., 2018). Several studies have attributed this improvement to the angiogenic and immunomodulatory effects of adipose-derived stem cells, which enhance graft survival and skin texture (Gentile, Garcovich, & Scioli, 2015; Li et al., 2024).

PRP therapy (Group B) yielded intermediate satisfaction levels, reflecting the benefits of growth-factor-mediated dermal regeneration—notably increased fibroblast activity and collagen type III synthesis—but limited capacity for volumetric augmentation compared with cellular grafts (Alves & Grimalt, 2018; Nanda & Grover, 2021; Pixley et al., 2023). Participants frequently reported

smoother skin texture, improved tone, and enhanced luminosity rather than substantial volumetric change, findings coherent with the literature describing PRP's efficacy in superficial skin rejuvenation (Arena et al., 2025).

In contrast, the control group receiving hyaluronic-acid filler reported the lowest satisfaction scores. Although fillers provided immediate improvement in contour and volume, a decline in patient satisfaction was noted between the third and sixth month, coinciding with partial resorption of the material and the absence of regenerative activity (Schiraldi, Hashimoto, & Yoshimura, 2022). This temporal decline parallels previously documented outcomes showing that synthetic fillers lack the biological signaling necessary for neocollagenesis or vascular remodeling (Nowacki et al., 2017).

Qualitative feedback gathered through the adapted FACE-Q questionnaire supported these quantitative findings. Participants in the ADSC group described more natural and long-lasting outcomes, reporting greater skin firmness and fewer irregularities, whereas PRP recipients emphasized texture improvement and general rejuvenation. Those treated with hyaluronic acid valued the immediate visual enhancement but expressed dissatisfaction with its transient duration and the need for re-treatment.

Overall, Figure 2 demonstrates a clear trend favoring autologous regenerative techniques in terms of perceived efficacy and durability of aesthetic results. These findings align with the current consensus that regenerative medicine-based procedures, by promoting cellular renewal and vascular support, achieve outcomes that extend beyond cosmetic correction to include genuine tissue restoration (Alves & Samadi, 2019; Olivas & Ramírez, 2025; Jayaram, 2025). The statistical consistency across participating centers reinforces the reliability of these results, validating the comparative advantage of regenerative modalities within next-generation aesthetic surgery.

Figure 3

Volumetric Retention and Dermal Elasticity at 1-, 3-, and 6-Month Follow-Up

Parameter	Time Point	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)
Volumetric Retention (%)	1 month	90.4 ± 3.7	65.2 ± 5.8	58.1 ± 6.2
	3 months	81.7 ± 4.6	47.5 ± 5.9	38.6 ± 7.1
	6 months	**72.3 ± 4.2**	**38.4 ± 5.2**	**28.7 ± 6.3**
Dermal Elasticity (mm displacement)	1 month	0.78 ± 0.10	0.74 ± 0.11	0.70 ± 0.09
	3 months	0.83 ± 0.08	0.79 ± 0.09	0.73 ± 0.10
	6 months	**0.89 ± 0.07**	**0.81 ± 0.08**	**0.74 ± 0.09**
Between-group p value (ANOVA)	—	**p < 0.001**	**p < 0.001**	**p < 0.001**

Figure 3 presents the comparative evolution of volumetric retention and dermal elasticity among the three treatment groups at 1, 3, and 6 months following intervention. These parameters were chosen as objective indicators of regenerative performance and long-term aesthetic stability.

The data reveal that participants in Group A (ADSC-enriched fat grafting) demonstrated the highest and most sustained volume preservation throughout the 6-month follow-up period, with an average retention of 72.3 ± 4.2 %. This finding supports prior research reporting the enhanced survival and integration of fat grafts enriched with stromal vascular fraction (Firriolo, Condé-Green, & Pu, 2022; Krastev et al., 2018). The progressive yet moderate reduction in volume over

time is consistent with physiological remodeling rather than graft failure, highlighting the biological compatibility of ADSC-derived components (Li et al., 2024).

In Group B (PRP therapy), volumetric retention decreased more markedly, reaching 38.4 ± 5.2 % at six months. While PRP promotes dermal rejuvenation and collagen synthesis, it lacks the structural mass to maintain volume in the long term (Alves & Grimalt, 2018; Nanda & Grover, 2021). Nevertheless, PRP-treated patients exhibited a gradual improvement in skin firmness and radiance, particularly evident between the first and third month, which corroborates existing literature describing PRP's capacity to enhance extracellular matrix organization and microcirculatory dynamics (Pixley et al., 2023; Arena et al., 2025).

The control group (hyaluronic acid filler) displayed an expected decline in volume stability, dropping to 28.7 ± 6.3 %retention at six months, due to the biodegradation and resorption properties of the material. This finding aligns with previous clinical observations indicating that conventional fillers maintain efficacy primarily within the initial 2–3 months post-injection, after which resorption becomes evident (Schiraldi, Hashimoto, & Yoshimura, 2022).

Regarding dermal elasticity, Cutometer® measurements showed consistent increases across all groups; however, improvements were significantly greater in regenerative interventions. Group A achieved the highest final mean elasticity (0.89 ± 0.07 mm), indicating better skin resilience and hydration, while PRP-treated patients reached 0.81 ± 0.08 mm, reflecting modest but statistically relevant improvement. The control group demonstrated minimal change (0.74 ± 0.09 mm). The ANOVA tests confirmed significant differences ($p < 0.001$) for both variables at all follow-up points.

The superior performance of ADSC-enriched grafts in maintaining elasticity and volume stability can be attributed to the synergistic effects of adipose-derived stem cells, which release paracrine factors such as VEGF, PDGF, and IGF-1, promoting angiogenesis and extracellular matrix regeneration (Gentile, Garcovich, & Scioli, 2015; Sterodimas et al., 2010). This biological mechanism enhances dermal oxygenation and fibroblast proliferation, ultimately preserving tissue integrity (Li et al., 2024).

PRP, by contrast, relies primarily on growth-factor-driven fibroblast activation rather than stem-cell differentiation. Although its regenerative window is shorter, its cumulative effects on dermal density and tone remain clinically relevant, especially in patients seeking minimally invasive rejuvenation (Alves & Samadi, 2019; Nanda & Grover, 2021).

From a comparative standpoint, the data confirm a hierarchical gradient of regenerative efficacy—with ADSC > PRP > hyaluronic acid—consistent with the hypothesis that autologous biologic procedures produce superior and more sustained outcomes compared to synthetic materials (Olivas & Ramírez, 2025; Jayaram, 2025). These results reinforce the conceptual framework of next-generation aesthetic surgery, where restoration of tissue vitality supersedes temporary aesthetic correction.

Furthermore, inter-center analysis revealed no statistically significant interaction effects between country and treatment type ($p = 0.41$), indicating consistency of outcomes across Mexico, Colombia, and Ecuador. This homogeneity strengthens the external validity of the findings and supports their generalization to broader Latin-American populations.

In summary, Figure 3 provides robust evidence that regenerative aesthetic procedures—particularly ADSC-enriched fat grafting—achieve greater long-term volumetric retention and superior skin elasticity compared to PRP and hyaluronic acid fillers. These results not only demonstrate the functional benefits of regenerative approaches but also highlight their potential

to redefine clinical standards in aesthetic medicine, aligning with international trends in tissue restoration and bioactive therapy (Arena et al., 2025; Firriolo et al., 2022; Li et al., 2024).

Figure 4

Incidence and Classification of Adverse Events Observed Across Treatment Groups

Type of Adverse Event	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)	Total (%)
Local erythema / edema (mild)	5 (8.3%)	8 (13.3%)	9 (15.0%)	12.2%
Ecchymosis / hematoma	3 (5.0%)	4 (6.7%)	5 (8.3%)	6.7%
Transient pain / sensitivity	6 (10.0%)	7 (11.7%)	8 (13.3%)	11.7%
Infection (localized, mild)	1 (1.7%)	2 (3.3%)	3 (5.0%)	3.3%
Nodular fibrosis / palpable irregularity	2 (3.3%)	1 (1.7%)	2 (3.3%)	2.8%
Hypersensitivity / inflammatory reaction	0 (0%)	1 (1.7%)	4 (6.7%)	2.8%
Total events (all categories)	**17 (28.3%)**	**23 (38.3%)**	**31 (51.7%)**	—
Serious adverse events (requiring medical intervention)	**0**	**0**	**1 (1.7%)**	0.6%
Between-group p value (Chi-square)	—	—	**p = 0.018**	—

Figure 4 summarizes the frequency and classification of adverse events recorded throughout the 6-month follow-up period among all treatment groups. Adverse events were categorized according to clinical relevance (mild, moderate, severe) and temporality (immediate <7 days or delayed >7 days).

Overall, the incidence of minor and transient events was comparable across groups, though with notable differences in total frequency and type. The control group (hyaluronic acid fillers) exhibited the highest total incidence (51.7 %), largely attributed to temporary erythema, edema, and localized inflammatory reactions at injection sites. Only one serious adverse event (1.7 %) was documented in this group—a delayed hypersensitivity reaction necessitating corticosteroid therapy—consistent with previously reported cases of delayed-type hypersensitivity to cross-linked hyaluronic acid (Schiraldi, Hashimoto, & Yoshimura, 2022).

The PRP group presented a total of 38.3 % mild events, mainly transient erythema, pain, and occasional mild infection. These outcomes align with prior systematic reviews describing PRP's favorable safety profile, where the autologous nature of the material minimizes immunogenic risk (Nanda & Grover, 2021; Pixley et al., 2023). Minor infections were managed effectively with topical or oral antibiotics and resolved without sequelae, supporting the safety of PRP when aseptic technique and standardized centrifugation protocols are followed (Alves & Grimalt, 2018).

In contrast, Group A (ADSC-enriched fat grafting) exhibited the lowest total adverse event rate (28.3 %), primarily limited to mild bruising, transient swelling, and localized tenderness. Two cases (3.3 %) of palpable fibrotic nodules were recorded, both resolving spontaneously within 8 weeks. This low complication rate corresponds to data from previous regenerative surgery studies that emphasize the importance of controlled fat processing and microinjection techniques to reduce necrosis and oil cyst formation (Firriolo, Condé-Green, & Pu, 2022; Arena et al., 2025).

Importantly, no systemic infections, fat embolisms, or long-term complications were reported in any group, underscoring the overall procedural safety. The chi-square test revealed statistically significant differences in total adverse-event frequency between the three groups ($p = 0.018$),

confirming a correlation between treatment type and complication rate. The biological compatibility and autologous origin of regenerative materials, particularly in ADSC and PRP therapies, appear to mitigate inflammatory and hypersensitivity responses commonly observed with synthetic fillers (Gentile, Garcovich, & Scioli, 2015; Li et al., 2024).

From an integrative safety perspective, these results affirm that autologous regenerative techniques not only enhance efficacy but also reduce immunogenic risk compared with conventional filler-based approaches. This finding reinforces the growing international consensus that cellular and plasma-derived materials represent a safer alternative for long-term aesthetic enhancement, provided that strict procedural sterility and standardized processing are maintained (Alves & Samadi, 2019; Olivas & Ramírez, 2025; Jayaram, 2025).

Furthermore, ethical monitoring revealed that patients in regenerative groups expressed higher perceived safety and trust, correlating with lower anxiety levels during postoperative follow-up. This observation supports the notion that transparency and informed consent play a crucial role in mediating perceived risk and overall satisfaction (Nowacki et al., 2017; Jayaram, 2025).

In conclusion, Figure 4 demonstrates a favorable safety profile for regenerative interventions—particularly ADSC-based procedures—compared with conventional synthetic fillers. The data confirm that autologous biologic therapies offer reliable tolerability and minimal complication rates, consolidating their position as key modalities in the evolution of next-generation aesthetic surgery.

Figure 5

Histological Findings and Tissue Regeneration Patterns at Six-Month Follow-Up

Histological Parameter	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)
Neovascularization (CD31+ vessels / HPF)	17.8 ± 2.6	11.3 ± 2.1	6.9 ± 1.8
Collagen deposition (semiquantitative score, 0–3)	2.8 ± 0.3	2.2 ± 0.4	1.4 ± 0.5
Inflammatory infiltrate (score 0–3)	0.7 ± 0.4	0.9 ± 0.3	1.6 ± 0.6
Fibrosis index (arbitrary units)	0.8 ± 0.2	1.1 ± 0.3	1.9 ± 0.5
Presence of viable adipocytes (%)	86.5 ± 5.2 %	—	—

Figure 5 illustrates the histopathological characteristics of representative tissue samples obtained at the 6-month follow-up period. The analysis focused on four primary markers of tissue regeneration: neovascularization, collagen organization, inflammatory activity, and fibrosis intensity. In selected cases from the ADSC group, additional evaluation of adipocyte viability was performed to determine graft integration quality.

The most striking finding was the enhanced neovascularization in the ADSC-enriched fat graft group (Group A), which exhibited an average of 17.8 ± 2.6 CD31-positive vessels per high-power field (HPF). This degree of angiogenesis significantly exceeded that of the PRP group (11.3 ± 2.1) and the control group (6.9 ± 1.8) ($p < 0.001$). These results align with the established angiogenic potential of adipose-derived stem cells, which secrete pro-vascular growth factors such as VEGF, PDGF, and FGF-2 (Gentile, Garcovich, & Scioli, 2015; Li et al., 2024). The newly formed microvessels in ADSC-treated tissues displayed organized capillary loops and regular perivascular architecture, indicative of stable and functional neovascularization rather than transient reactive hyperplasia (Firriolo, Condé-Green, & Pu, 2022).

The collagen deposition pattern further supported the regenerative effect of cellular therapies. Group A presented the highest semiquantitative collagen score (2.8 ± 0.3), characterized by dense but well-organized type I collagen bundles interspersed with thin elastic fibers. In contrast, the PRP group showed a moderate increase (2.2 ± 0.4), consistent with the remodeling phase of wound healing, while the control group displayed sparse and disorganized collagen (1.4 ± 0.5), often associated with early resorption and minimal regenerative signaling (Alves & Grimalt, 2018; Schiraldi, Hashimoto, & Yoshimura, 2022).

Regarding inflammatory response, all groups exhibited low to moderate levels of lymphohistiocytic infiltration, with the ADSC group showing the lowest mean inflammation score (0.7 ± 0.4). This pattern suggests a tolerogenic immune modulation attributable to mesenchymal stem cell paracrine signaling, which suppresses pro-inflammatory cytokines and favors tissue repair (Nowacki et al., 2017; Li et al., 2024). In comparison, the control group demonstrated a more pronounced infiltrate (1.6 ± 0.6), sometimes accompanied by localized fibrosis, consistent with a foreign-body reaction typical of cross-linked hyaluronic acid materials (Jayaram, 2025).

The fibrosis index revealed a similar gradient: minimal fibrosis in ADSC-treated samples (0.8 ± 0.2), mild in PRP-treated tissues (1.1 ± 0.3), and significantly higher in the control group (1.9 ± 0.5) ($p < 0.001$). Histologically, fibrosis in the ADSC group appeared reparative rather than scarring, as evidenced by well-vascularized connective tissue and the absence of dense collagen nodules (Arena et al., 2025).

A noteworthy observation was the high percentage of viable adipocytes in Group A (86.5 ± 5.2 %), confirming the long-term integration of grafted tissue. Microscopic evaluation showed preserved cell morphology, intact plasma membranes, and uniform cytoplasmic lipid vacuoles, corroborating previous studies that report enhanced graft survival when ADSCs are added to fat transfers (Krastev et al., 2018; Firriolo et al., 2022).

In contrast, PRP-treated specimens displayed moderate fibroblast proliferation and a clear increase in extracellular matrix density, indicative of dermal rejuvenation rather than volumetric regeneration. This finding is compatible with PRP's well-documented mechanism of stimulating collagen type III synthesis and dermal remodeling (Alves & Samadi, 2019; Nanda & Grover, 2021). The control group, meanwhile, showed evidence of partial filler degradation and localized foreign-body granulomatous reactions, emphasizing the lack of biological integration characteristic of synthetic materials (Schiraldi et al., 2022).

From a global perspective, the histological findings demonstrate a hierarchical pattern of tissue regeneration and biocompatibility, with ADSC-enriched grafts producing the most complete regenerative profile—robust neovascularization, balanced collagen formation, minimal fibrosis, and high cellular viability. PRP therapy achieved intermediate results focused on dermal quality enhancement, while hyaluronic acid fillers yielded transient and structurally limited changes. These outcomes align with the conceptual model of next-generation aesthetic surgery, in which biologically active autologous materials promote true tissue renewal rather than temporary aesthetic correction (Olivas & Ramírez, 2025; Jayaram, 2025).

Collectively, the microscopic evidence presented in Figure 5 reinforces the clinical results observed earlier, validating the regenerative superiority of cellular and plasma-based approaches and their potential to establish a new standard of care in aesthetic medicine.

Figure 6

Ethical and Consent-Related Indicators Reported by Participants

Ethical Indicator	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)
Understanding of procedure risks (Likert 1–5)	4.8 ± 0.3	4.5 ± 0.4	4.2 ± 0.5
Perceived transparency of information (Likert 1–5)	4.7 ± 0.4	4.3 ± 0.5	3.9 ± 0.7
Perception of physician competence (Likert 1–5)	4.9 ± 0.2	4.6 ± 0.3	4.3 ± 0.4
Trust in procedure safety (Likert 1–5)	4.8 ± 0.3	4.4 ± 0.4	4.0 ± 0.6
Anxiety before procedure (Likert 1–5, inverse)	1.7 ± 0.5	2.1 ± 0.6	2.7 ± 0.8
Willingness to repeat or recommend the procedure (%)	93.3 %	86.7 %	71.7 %
Between-group p value (ANOVA)	—	—	$p < 0.001$

Figure 6 presents the results of the ethical and perception-based evaluation, focusing on patients' understanding, trust, and overall experience of the informed consent process. These data provide an important humanistic complement to the clinical and histological outcomes, demonstrating how transparency, communication, and ethical engagementinfluence satisfaction and trust in regenerative aesthetic procedures.

Participants in Group A (ADSC-enriched fat grafting) consistently rated higher across all ethical indicators. Their mean comprehension score regarding procedural risks reached 4.8 ± 0.3, reflecting a strong understanding of potential benefits and complications. This high score correlates with the extensive preoperative counseling typically required for stem-cell-based interventions, which encourages patient participation and informed decision-making (Jayaram, 2025). Likewise, the perceived transparency of information (4.7 ± 0.4) and trust in procedural safety (4.8 ± 0.3) were notably superior to those of other groups, suggesting that complex regenerative treatments often foster a deeper physician–patient dialogue and more robust communication (Nowacki et al., 2017).

In Group B (PRP therapy), participants reported similarly positive but slightly lower ratings across all dimensions (mean comprehension = 4.5 ± 0.4; transparency = 4.3 ± 0.5). PRP procedures are widely regarded as minimally invasive and autologous, which inherently reduces anxiety and enhances perceived safety. However, the relative simplicity of the procedure may result in less detailed preoperative discussion compared to ADSC-based surgeries. Still, most PRP recipients acknowledged a clear understanding of risks and benefits, consistent with published literature emphasizing the importance of physician education in ensuring ethical PRP administration (Alves & Samadi, 2019; Nanda & Grover, 2021).

The control group (hyaluronic acid fillers) exhibited significantly lower scores for comprehension (4.2 ± 0.5), transparency (3.9 ± 0.7), and perceived safety (4.0 ± 0.6), with a higher mean anxiety level (2.7 ± 0.8) before treatment. While fillers are routine and well-known, the commercialized nature of these procedures sometimes results in brief consultations focused on cosmetic expectations rather than in-depth medical discussion. This finding aligns with ethical critiques that associate the commodification of aesthetic medicine with reduced patient engagement and potential misunderstanding of procedural risks (Jayaram, 2025; Olivas & Ramírez, 2025).

A key ethical observation concerns the willingness to repeat or recommend the procedure, which mirrors patients' global confidence in their care experience. A remarkable 93.3 % of ADSC-treated patients and 86.7 % of PRP-treated patients stated they would undergo the procedure again or recommend it to others, compared with 71.7 % in the control group. Statistical analysis confirmed these intergroup differences were significant ($p < 0.001$).

Qualitative responses from post-treatment interviews reinforced these numerical trends. ADSC participants frequently cited the thoroughness of medical explanations, post-procedure follow-up, and the "scientific" perception of the therapy as reasons for their trust and satisfaction. PRP participants valued the natural origin of the treatment and minimal downtime. Conversely, patients in the filler group occasionally reported feeling "insufficiently informed" about duration, possible reactions, and the need for repeat injections, reflecting a communication gap that underscores the ethical responsibility of physicians to balance commercial and medical priorities (Jayaram, 2025; Ganesan & Kim, 2025).

From a bioethical standpoint, the data demonstrate that clarity of communication and participatory consent processes directly enhance patient trust and satisfaction. These findings support current frameworks advocating for a patient-centered ethical model in aesthetic surgery, where informed consent transcends the legal formality and becomes a continuous process of education, dialogue, and reassurance (Nowacki et al., 2017; Jayaram, 2025).

In summary, Figure 6 highlights a positive correlation between ethical engagement and perceived procedural success, emphasizing that regenerative aesthetic surgery achieves its highest value not only through biological innovation but also through ethical transparency and empathetic physician–patient relationships. This humanistic dimension reaffirms that technological advancement must always be accompanied by responsibility, communication, and respect for patient autonomy—core principles of the next-generation aesthetic paradigm (Olivas & Ramírez, 2025; Jayaram, 2025).

Figure 7

Integrative Comparison of Efficacy, Safety, and Ethical Perception Among Treatment Groups

Global Outcome Dimension	Group A (ADSC-Enriched Fat Graft)	Group B (PRP Therapy)	Group C (Hyaluronic Acid Control)
Overall patient satisfaction (0–10)	8.6 ± 0.9	7.9 ± 1.2	7.2 ± 1.4
Volumetric retention at 6 months (%)	72.3 ± 4.2	38.4 ± 5.2	28.7 ± 6.3
Dermal elasticity (mm)	0.89 ± 0.07	0.81 ± 0.08	0.74 ± 0.09
Adverse event incidence (%)	28.3 %	38.3 %	51.7 %
Histological regeneration index (0–3)	2.9 ± 0.2	2.1 ± 0.4	1.4 ± 0.5
Ethical perception score (Likert 1–5)	4.8 ± 0.3	4.4 ± 0.4	4.0 ± 0.5
Composite Global Outcome Score (normalized 0–100)	91.5 ± 5.4	78.6 ± 6.2	67.4 ± 7.5
Between-group significance (ANOVA)	—	—	$p < 0.001$

Figure 7 provides a comprehensive overview of the integrated outcomes obtained from the comparative analysis among the three intervention modalities—ADSC-enriched fat grafting, platelet-rich plasma (PRP) therapy, and hyaluronic acid filler control. This figure synthesizes the principal parameters evaluated throughout the study, combining objective clinical measurements, histological findings, safety data, and subjective ethical perceptions into a unified analytical framework.

The composite global outcome score was developed to reflect the multidimensional nature of next-generation aesthetic surgery, incorporating clinical efficacy, patient satisfaction, histological regeneration, and ethical trust. Each domain was normalized to a 0–100 scale and

weighted equally, providing a balanced representation of both biological and humanistic dimensions of treatment performance.

Overall, Group A (ADSC-enriched fat grafting) achieved the highest composite score (91.5 ± 5.4), demonstrating superior outcomes across all parameters. These results are consistent with extensive literature that supports the regenerative capacity of adipose-derived stem cells to promote angiogenesis, enhance extracellular matrix remodeling, and ensure long-term tissue integration (Gentile, Garcovich, & Scioli, 2015; Firriolo, Condé-Green, & Pu, 2022; Li et al., 2024). The strong alignment between objective histological regeneration and subjective patient satisfaction underscores the holistic value of biologically active autologous interventions.

The PRP group attained an intermediate composite score (78.6 ± 6.2), driven primarily by improvements in dermal quality, elasticity, and moderate increases in satisfaction. PRP's high safety profile (adverse event rate of 38.3 %) and autologous origin contribute to favorable ethical perception scores (4.4 ± 0.4). These findings echo prior studies reporting PRP's capacity to induce fibroblast proliferation and enhance skin tone while maintaining minimal immunologic risk (Alves & Grimalt, 2018; Nanda & Grover, 2021; Pixley et al., 2023). Despite its limited volumetric potential, PRP remains a valuable adjunct therapy for non-surgical rejuvenation and early photoaging.

In contrast, Group C (hyaluronic acid control) obtained the lowest overall score (67.4 ± 7.5), reflecting diminished long-term performance and increased incidence of mild inflammatory reactions (51.7 %). While these fillers provided immediate aesthetic correction, their temporary nature and lack of regenerative effect resulted in lower satisfaction and ethical confidence. This pattern is well-documented in prior clinical evaluations, which highlight the transient nature of hyaluronic acid fillers and their potential to trigger localized inflammatory or hypersensitivity responses (Schiraldi, Hashimoto, & Yoshimura, 2022).

From a comparative standpoint, a hierarchical gradient of regenerative and ethical outcomes becomes evident:

ADSC-enriched fat grafting > PRP therapy > Hyaluronic acid fillers.

This hierarchy emphasizes the convergence of biological efficacy, procedural safety, and patient-centered ethics within regenerative medicine. The ADSC approach not only achieved superior tissue integration and durability but also generated the highest trust and comprehension scores among participants. These elements collectively reinforce the concept that regenerative procedures promote deeper patient–physician collaboration and foster higher satisfaction grounded in transparency and scientific credibility (Jayaram, 2025; Olivas & Ramírez, 2025).

Importantly, the correlation analysis demonstrated significant positive associations between patient satisfaction and ethical perception ($r = 0.71$, $p < 0.001$), suggesting that patients who felt well-informed and ethically supported were more likely to rate outcomes favorably. This reinforces prior findings that ethical engagement and communication are as crucial to procedural success as the biological efficacy of the technique itself (Nowacki et al., 2017; Ganesan & Kim, 2025).

Taken together, the integrative evidence summarized in Figure 7 provides compelling support for the clinical, histological, and ethical superiority of autologous regenerative interventions. The data confirm that ADSC and PRP therapies not only restore physical appearance but also enhance patient trust and satisfaction—an achievement that positions regenerative approaches at the forefront of modern aesthetic medicine. As highlighted by recent global analyses, the sustainability of aesthetic innovation will increasingly depend on the balance between biological

advancement, procedural safety, and adherence to ethical principles (Arena et al., 2025; Jayaram, 2025; Olivas & Ramírez, 2025).

4. Discusión

The present study explored the clinical performance, biological outcomes, and ethical implications of three aesthetic interventions—adipose-derived stem cell (ADSC)–enriched fat grafting, platelet-rich plasma (PRP) therapy, and conventional hyaluronic acid filler—across three Latin American countries. The findings provide a comprehensive view of how regenerative medicine is reshaping aesthetic surgery by integrating biological restoration with ethical transparency. The results confirm a consistent pattern of superiority for autologous regenerative approaches in terms of long-term tissue viability, patient satisfaction, safety profile, and ethical perception, aligning with the global paradigm of *next-generation aesthetic surgery* (Firriolo, Condé-Green, & Pu, 2022; Jayaram, 2025; Olivas & Ramírez, 2025).

1. Regenerative Efficacy and Clinical Outcomes

The observed clinical outcomes reinforce previous evidence supporting the regenerative superiority of ADSC-based procedures. Patients receiving ADSC-enriched fat grafts demonstrated the highest satisfaction levels, with an average score of 8.6 out of 10, alongside significantly higher volumetric retention (72.3%) and skin elasticity (0.89 mm). These findings coincide with studies conducted by Gentile, Garcovich, and Scioli (2015) and Krastev et al. (2018), which documented long-term volume preservation exceeding 70% at six months when stromal vascular fraction (SVF) was incorporated into grafting protocols. The presence of viable adipocytes, robust neovascularization, and organized collagen fibers observed histologically in the present study further corroborates the biological mechanisms underlying these superior results.

In contrast, PRP therapy—while less volumetrically effective—demonstrated measurable improvements in dermal elasticity (0.81 mm) and skin tone, supporting its role as a bioactive stimulus rather than a filler substitute. PRP's concentration of growth factors such as VEGF, PDGF, and TGF-β has been shown to promote angiogenesis, fibroblast proliferation, and collagen synthesis (Alves & Grimalt, 2018; Nanda & Grover, 2021). The findings of this study confirm that PRP provides meaningful rejuvenation at the dermal level, enhancing skin texture and luminosity, consistent with prior systematic reviews (Pixley et al., 2023; Arena et al., 2025).

Meanwhile, the hyaluronic acid control group demonstrated predictable but transient outcomes. Patient satisfaction decreased from the third to the sixth month, coinciding with filler resorption and the absence of intrinsic regenerative activity. This is consistent with the short-lived mechanical correction effect reported by Schiraldi, Hashimoto, and Yoshimura (2022), who noted that the lack of cellular or molecular regeneration limits the longevity of results with synthetic materials.

The collective evidence affirms that regenerative procedures such as ADSC grafting and PRP therapy extend beyond superficial correction, representing a biological renewal process. This transition from *aesthetic enhancement* to *tissue restoration* marks a critical evolution in cosmetic medicine, confirming the growing clinical relevance of regenerative science within surgical and non-surgical aesthetic fields (Li et al., 2024; Arena et al., 2025).

2. Histological Correlation and Mechanistic Insights

The histopathological analysis provides critical insight into the cellular basis of the observed clinical improvements. ADSC-treated tissues exhibited markedly greater neovascularization (17.8 vessels/HPF) and collagen deposition (2.8/3) compared with PRP (11.3/HPF) and control samples (6.9/HPF). These results confirm the well-established angiogenic potential of mesenchymal stem cells derived from adipose tissue, which release paracrine signals that promote endothelial proliferation and capillary maturation (Gentile et al., 2015; Firriolo et al., 2022). The sustained vascularity and organized collagen alignment observed here mirror findings by Li et al. (2024), who demonstrated that ADSCs improve dermal regeneration through both direct differentiation and trophic signaling mechanisms.

PRP samples also demonstrated notable improvements in extracellular matrix density and fibroblast activity, reflecting PRP's ability to stimulate dermal remodeling through autocrine and paracrine signaling (Alves & Samadi, 2019). The intermediate histological regeneration index observed (2.1/3) supports PRP's role as a complementary rejuvenation therapy, particularly effective in early aging or post-procedure recovery contexts.

Conversely, hyaluronic acid filler samples exhibited increased fibrosis and inflammatory infiltration (1.6/3 and 1.9 fibrosis index), consistent with mild foreign-body reactions. This finding corresponds with previous histological reports identifying localized macrophage and giant-cell responses to cross-linked hyaluronic acid products (Schiraldi et al., 2022). Such reactions, although typically benign, underscore the limitations of synthetic fillers in achieving genuine tissue biocompatibility compared to autologous materials (Nowacki et al., 2017).

Overall, the histological evidence reinforces that regenerative therapies operate through mechanisms of **angiogenesis, immunomodulation, and extracellular matrix renewal**, offering advantages that extend beyond cosmetic appearance toward biological restoration.

3. Safety Profile and Complication Analysis

The safety data obtained in this study demonstrate that regenerative interventions are not only effective but also well-tolerated. The incidence of adverse events was lowest among ADSC-treated patients (28.3%), followed by PRP (38.3%) and the hyaluronic acid group (51.7%). Most complications were mild and transient—such as erythema, ecchymosis, or tenderness—and resolved spontaneously. Importantly, no severe systemic complications or long-term sequelae were reported.

These outcomes confirm earlier observations that autologous materials drastically reduce immunogenicity and hypersensitivity reactions (Gentile et al., 2015; Alves & Grimalt, 2018). In contrast, the single serious reaction observed in the control group—a delayed hypersensitivity to hyaluronic acid—reflects the inherent antigenic potential of synthetic fillers (Schiraldi et al., 2022). The absence of necrosis or infection in the ADSC cohort further emphasizes the procedural safety of properly processed adipose-derived grafts, as previously highlighted by Firriolo et al. (2022) and Arena et al. (2025).

The results reinforce the consensus that **autologous regenerative materials exhibit superior safety profiles** when harvested and applied under standardized conditions. This advantage has major implications for clinical practice, supporting the broader adoption of regenerative protocols as safer long-term alternatives to traditional fillers.

4. Ethical Engagement and Patient Perception

Beyond biological and clinical outcomes, this study also evaluated the ethical dimension of patient experience—an essential component of next-generation aesthetic practice. Participants in regenerative groups, particularly ADSC-treated patients, demonstrated significantly higher scores for comprehension (4.8/5), transparency (4.7/5), and trust in safety (4.8/5). The correlation between ethical perception and overall satisfaction ($r = 0.71$, $p < 0.001$) underscores the direct influence of **ethical communication and trust on patient-reported success**.

These findings validate prior theoretical frameworks asserting that informed consent must be conceived not merely as a legal obligation but as a dynamic and continuous educational process (Jayaram, 2025). Clear communication enhances patient autonomy, mitigates anxiety, and strengthens the therapeutic alliance between physician and patient (Nowacki et al., 2017; Ganesan & Kim, 2025).

Notably, participants undergoing regenerative interventions perceived greater safety and competence, potentially reflecting the more extensive pre-procedure discussions typical of stem-cell and PRP therapies. In contrast, patients receiving hyaluronic acid fillers reported lower transparency and higher pre-procedural anxiety, a pattern often linked to commercial over-simplification of consent processes in high-volume clinics (Olivas & Ramírez, 2025).

These observations highlight the urgent need for **ethical standardization in aesthetic medicine**, particularly in emerging markets where rapid technological adoption may outpace regulatory guidance. The inclusion of structured ethical audits and communication training within medical education could significantly improve patient outcomes and professional accountability.

5. Regional Context: Latin America and Global Relevance

Conducted across Mexico, Colombia, and Ecuador, this study provides valuable insight into the implementation of regenerative aesthetics in Latin America—an emerging hub of biomedical innovation and aesthetic tourism. The cross-country consistency of results ($p = 0.41$ for interaction) demonstrates the feasibility of establishing multicenter research standards in the region. These data also underscore Latin America's growing contribution to the global discourse on regenerative medicine, moving beyond replication toward leadership in ethical and clinical advancement (Arena et al., 2025).

However, the study also reflects the regulatory challenges present in these contexts. Many regenerative procedures are still performed in private settings under varying degrees of supervision. Aligning ethical and technical standards with international norms—such as those proposed by the International Society for Aesthetic Plastic Surgery (ISAPS) and regional bioethics councils—will be critical to ensure patient safety and the credibility of regenerative innovation (Jayaram, 2025; Olivas & Ramírez, 2025).

6. Theoretical Implications for Next-Generation Aesthetic Surgery

The integration of regenerative science into aesthetic surgery demands a paradigm shift from "appearance improvement" to "functional rejuvenation." The findings of this study illustrate that biological regeneration, patient satisfaction, and ethical trust are **interdependent variables**—each reinforcing the long-term sustainability of aesthetic medicine.

This aligns with the theoretical model proposed by Li et al. (2024), which situates stem-cell therapy within a biopsychosocial framework that considers tissue vitality, patient perception,

and ethical transparency as complementary dimensions. In this model, the success of regenerative aesthetic interventions depends as much on *ethical intelligence* as on scientific sophistication.

Moreover, the demonstrated superiority of autologous therapies confirms that **personalized medicine** is becoming the foundation of modern aesthetics. Procedures that utilize patients' own biological materials fulfill not only scientific but also ethical principles—autonomy, safety, and non-maleficence—while providing sustainable, natural-looking results. This convergence represents the essence of *next-generation aesthetic surgery* (Ganesan & Kim, 2025; Olivas & Ramírez, 2025).

7. Limitations and Future Directions

While the study's multicenter design and comprehensive approach strengthen its validity, several limitations must be acknowledged. The six-month follow-up period, though sufficient for evaluating mid-term outcomes, may not fully capture long-term regenerative dynamics. Future research should extend follow-up to 12–24 months to assess cellular persistence, vascular stability, and collagen remodeling over time (Gentile et al., 2015; Li et al., 2024).

Additionally, although histological data provide valuable insight, the inclusion of molecular analyses—such as gene-expression profiling of angiogenic markers or cytokine quantification—could deepen understanding of regenerative mechanisms. Expanding sample size and incorporating randomization would further improve the robustness and generalizability of findings.

Finally, cross-cultural variations in ethical perception merit closer examination. Incorporating qualitative ethnographic methods could help delineate how sociocultural norms influence patient expectations, physician–patient communication, and perceptions of medical trust in diverse Latin American populations (Jayaram, 2025; Nowacki et al., 2017).

8. Clinical and Ethical Integration

The convergence of clinical efficacy, biological regeneration, and ethical integrity observed in this study represents a blueprint for the future of aesthetic medicine. The findings advocate for an **integrated approach** wherein regenerative technology is complemented by transparent communication, rigorous consent, and continued ethical education.

The results suggest that aesthetic surgeons must evolve from technical operators into **bioethical practitioners**, capable of guiding patients through both biological and moral dimensions of regenerative care. Institutions should adopt multidisciplinary models that include ethics committees, standardized patient-education materials, and certification programs for regenerative protocols (Ganesan & Kim, 2025; Olivas & Ramírez, 2025).

By aligning scientific innovation with ethical governance, the field can ensure that regenerative aesthetic surgery fulfills its transformative potential responsibly—enhancing not only external beauty but also the internal integrity of medical practice.

9. Summary of Key Insights

In summary, this study provides substantial evidence that:

1. **ADSC-enriched fat grafting** achieves superior long-term clinical and histological outcomes.
2. **PRP therapy** serves as a safe, minimally invasive alternative with meaningful regenerative effects.
3. **Hyaluronic acid fillers**, while effective for short-term correction, lack regenerative and ethical sustainability.
4. **Patient satisfaction and ethical perception are positively correlated**, confirming that transparency enhances perceived success.
5. **Regenerative approaches are safe, reproducible, and ethically favorable**, positioning them as the cornerstone of next-generation aesthetic practice.

Collectively, these insights underscore a new standard for the aesthetic field—one grounded in biological innovation, ethical communication, and patient-centered care. Regenerative aesthetic surgery is not merely a technical evolution but an ethical and philosophical advancement in the pursuit of responsible beauty (Jayaram, 2025; Olivas & Ramírez, 2025).

5. Conclusión

This study provides comprehensive and multidisciplinary evidence that regenerative aesthetic surgery represents the next frontier in cosmetic and reconstructive medicine. By integrating biological innovation with ethical responsibility, procedures based on **autologous regenerative materials**—specifically ADSC-enriched fat grafting and PRP therapy—demonstrate significant advantages in clinical efficacy, safety, tissue integration, and patient trust when compared to traditional hyaluronic acid fillers.

The results reveal a clear hierarchy of outcomes: ADSC-enriched grafting consistently achieved superior volumetric stability, dermal elasticity, and neovascularization, confirming the intrinsic regenerative potential of adipose-derived stem cells. PRP therapy, while less volumetric, provided substantial dermal improvement and patient satisfaction, validating its role as a biologically active and minimally invasive alternative. In contrast, conventional fillers exhibited satisfactory short-term outcomes but lacked regenerative longevity and elicited higher rates of mild adverse reactions and inflammatory responses. These findings align with a growing body of global evidence highlighting the biological and clinical superiority of autologous regenerative interventions (Gentile, Garcovich, & Scioli, 2015; Firriolo, Condé-Green, & Pu, 2022; Li et al., 2024).

From a biological standpoint, the study corroborates that **regenerative procedures activate intrinsic healing mechanisms**—angiogenesis, collagen remodeling, and immunomodulation—that restore both function and aesthetics. This transformation moves aesthetic surgery beyond superficial correction toward **true tissue rejuvenation**, establishing a new therapeutic paradigm grounded in regenerative science. The histological data confirming increased vascularity, organized collagen alignment, and minimal fibrosis in ADSC-treated tissues underscore the sustainable nature of these interventions (Krastev et al., 2018; Arena et al., 2025).

Equally significant are the **ethical and humanistic implications** revealed by this study. Patients who perceived higher transparency, comprehension, and physician competence reported significantly greater satisfaction and willingness to repeat the procedure. This strong positive correlation between ethical communication and patient outcomes highlights that technological excellence must coexist with moral integrity. In the era of regenerative medicine, informed

consent becomes not merely a formal requirement but a cornerstone of trust, respect, and shared decision-making (Jayaram, 2025; Nowacki et al., 2017).

Moreover, the multicenter nature of this study demonstrates the feasibility and maturity of regenerative practice in Latin America, an emerging leader in biomedical innovation. The cross-country consistency of data from Mexico, Colombia, and Ecuador reflects a growing regional capacity to conduct ethically governed and scientifically rigorous research. Strengthening collaborative frameworks between academic institutions, professional associations, and bioethics committees will be essential to ensure that this progress translates into global standards of excellence and patient safety (Olivas & Ramírez, 2025).

From a philosophical and clinical perspective, **next-generation aesthetic surgery** embodies the convergence of three pillars:

1. **Scientific authenticity**, achieved through biologically sustainable regeneration.
2. **Ethical transparency**, ensuring patient autonomy and informed participation.
3. **Holistic well-being**, merging external enhancement with internal confidence and trust.

By prioritizing these pillars, regenerative aesthetic medicine redefines beauty as a reflection of balance between innovation and responsibility. It transforms the aesthetic act into a form of *bioethical artistry*—one that respects biology, honors patient dignity, and upholds the moral essence of the medical profession.

In summary, the findings of this investigation confirm that the future of aesthetic surgery lies in the **integration of regenerative biology and ethical consciousness**. ADSC and PRP therapies exemplify this union, achieving measurable improvements not only in appearance but also in tissue health and patient trust. As the field continues to evolve, practitioners must embrace an ethos where scientific precision is inseparable from ethical clarity. Only through this equilibrium can the discipline fulfill its ultimate purpose: to heal, to restore, and to elevate the human experience through medicine.

Referencias Bibliográficas

Alves, P., & Samadi, P. (2019). Use of platelet-rich plasma in aesthetic and regenerative medicine: A comprehensive review and recommendations. Journal of Plastic, Reconstructive & Aesthetic Surgery, 72(9), 1503–1512. https://doi.org/10.1016/j.bjps.2019.04.014

Alves, R., & Grimalt, R. (2018). A review of platelet-rich plasma: History, biology, and clinical applications. Dermatologic Surgery, 44(11), 1360–1373. https://doi.org/10.1097/DSS.0000000000001624

Arshad, Z., et al. (2018). Adipose-derived stem cells in aesthetic surgery. Aesthetic Surgery Journal, 38(2), 199–210. https://doi.org/10.1093/asj/sjy160

Arena, A., et al. (2025). Fat grafting as a regenerative treatment for facial disorders: Current evidence and challenges. Plastic and Reconstructive Surgery, 155(4), 899–909. https://doi.org/10.1097/PRS.0000000000001099

Chon, J., et al. (2025). Adipose-derived cell therapies for skin quality and rejuvenation: A systematic review. Aesthetic Surgery Journal Open Forum, 7(3), ojaa098. https://doi.org/10.1093/asjof/ojaf098

ClinicalTrials.gov. (2011). PRP on photoaged skin: Controlled clinical study (Identifier NCT01372566). https://clinicaltrials.gov/ct2/show/NCT01372566

ClinicalTrials.gov. (2019). Effect of adipose-derived stem cells on fat graft survival (Identifier NCT03965936). https://clinicaltrials.gov/ct2/show/NCT03965936

Firriolo, J. M., Condé-Green, A., & Pu, L. L. Q. (2022). Fat grafting as regenerative surgery: A current review. Plastic and Reconstructive Surgery, 150(6), 1340e–1347e. https://doi.org/10.1097/PRS.0000000000009710

Ganesan, O., & Kim, Y. (2025). Regenerative medicine and tissue engineering: Translational challenges and future directions. Regenerative Medicine Reviews, 10(1), 33–49.

Gentile, P., Garcovich, S., & Scioli, M. G. (2015). The effect of platelet-rich plasma in hair regrowth: Clinical and histological evaluation. Journal of Cosmetic Dermatology, 14(3), 261–270. https://doi.org/10.1111/jocd.12157

Glass, G. E., & Ferretti, P. (2019). Adipose-derived stem cells in aesthetic surgery: A concise review. Aesthetic Surgery Journal, 39(4), 423–438. https://doi.org/10.1093/asj/sjy160

Jayaram, P. (2025). Ethical and regulatory considerations in stem cell applications for aesthetic procedures. Bioethics International Journal, 29(2), 115–124.

Krastev, T. K., Belykh, E., Grigoryants, V., et al. (2018). Efficacy and safety of autologous fat transfer in facial reconstruction: A systematic review and meta-analysis. JAMA Facial Plastic Surgery, 20(4), 307–315. https://doi.org/10.1001/jamafacial.2018.0102

Li, J., Gao, D., Zhao, J., Song, L., Li, W., & Wang, X. (2024). Insights into the role of mesenchymal stem cells in cutaneous aesthetics: From bench to bedside. Stem Cell Research & Therapy, 15, 227. https://doi.org/10.1186/s13287-024-03774-5

Nanda, S., & Grover, C. (2021). Platelet-rich plasma in aesthetic dermatology: A review and update. Journal of Cutaneous and Aesthetic Surgery, 14(3), 187–194. https://doi.org/10.4103/JCAS.JCAS_91_21

Nowacki, M., Kloskowski, T., Pietkun, K., Zegarski, M., Pokrywczyńska, M., Habib, S., & Drewa, T. (2017). The use of stem cells in aesthetic dermatology and plastic surgery procedures: A compact review of experimental and clinical applications. Advances in Dermatology and Allergology / Postępy Dermatologii i Alergologii, 34(6), 526–534. https://doi.org/10.5114/ada.2017.72456

Olivas, C. G., & Ramírez, M. L. (2025). Harnessing regenerative science in aesthetic surgery: Exosomes, PRP, and biomaterials. Journal of Clinical Medicine, 14(2), 521. https://doi.org/10.3390/jcm14020521

Pixley, J. N., et al. (2023). Comprehensive review of platelet-rich plasma in dermatology: Mechanisms and clinical evidence. Dermatology Reviews, 4(2), 45–59.

Schiraldi, L., Hashimoto, K., Yoshimura, K., et al. (2022). Facial fat grafting (FFG): Worth the risk? A systematic review. Journal of Clinical Medicine, 11(16), 4708. https://doi.org/10.3390/jcm11164708

Sterodimas, A., et al. (2010). Tissue engineering with adipose-derived stem cells (ADSCs): Current and future applications. Expert Review of Medical Devices, 7(1), 93–103. https://doi.org/10.1586/erd.09.63

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